STATEMENT OF PROJECT OBJECTIVES

Evaluation of MerCAP^{TM} for Power Plant Mercury Control

A. OBJECTIVES

URS Group and its test team will perform research to further develop the novel Mercury Control via Adsorption Process (MerCAP^{TM}). The general MerCAP^{TM} concept is to place fixed structures into a flue gas stream to adsorb mercury and then periodically regenerate them and recover the captured mercury. EPRI has shown that gold-based sorbents can achieve high levels of mercury removal in scrubbed flue gases. URS is proposing tests at two power plants using gold MerCAP^{TM}, installed downstream of either a baghouse or wet scrubber, to evaluate mercury removal from flue gas over a period of 6 months. At Great River Energy's Stanton Station, gold-coated MerCAP^{TM} plates will be incorporated into one entire compartment of a full-scale baghouse such that flue gas contacts them after passing through the filter bags. At Southern Company Services' Plant Yates, gold-coated plates will be configured as a mist eliminator (ME) located downstream of a 1 MWe pilot wet absorber. Additional tests are proposed to determine the ability to repeatedly thermally regenerate exposed gold MerCAP^{TM} plates in a 40-acfm test probe.

The results of this study will provide data required for assessing the feasibility and estimating the costs of a full-scale MerCAP^{TM} process for flue gas mercury removal. It will provide information about optimal operating conditions for different flue gas conditions, the effectiveness of sorbent regeneration, and the ability of the gold sorbent to hold up to flue gas over an extended period. In addition, if successful, the novel approach of incorporating MerCAP^{TM} structures in existing baghouse compartments will demonstrate a cost-effective means for achieving mercury control using existing baghouse technologies.

B. SCOPE OF WORK

The proposed project will test the gold MerCAP^{TM} concept at two utility host sites firing ND lignite or Eastern bituminous coal. Following initial design, gold-coated sorbent structures will be fabricated and configured at each plant to contact flue gas downstream of particulate and acid gas scrubbing. At Stanton Station (lignite), sorbent structures will be retrofitted into a single compartment in the Unit 10 baghouse enabling reaction with a 6 MWe equivalence of flue gas. At Plant Yates (bituminous), the fixed sorbent structures will be configured as a mist eliminator in an existing 1 MWe pilot absorber unit, which receives flue gas from Unit 1.

Sorbent structure installation at each site will be followed by a 1-week intensive gas characterization period including use of semi-continuous emission monitors (SCEMs) to evaluate mercury removal from flue gas flowing across the fixed sorbents. The sorbents will then remain in service for approximately 6 months during which periodic sampling trips will be made to evaluate performance.

Additional tests will be performed at each site to evaluate the ability to thermally regenerate the gold-coated plates. These tests will be carried out using 40-acfm extraction probes, treating flue gas obtained immediately upstream of the pilot test units, and will evaluate the effect of multiple regeneration cycles on sorbent performance.

C. TASKS TO BE PERFORMED

The objectives of this program will be accomplished through five primary tasks including: Project planning; Site 1 field testing; Site 2 field testing; economic analysis; and management and reporting. The expected duration of the program is 36 months. The baseline project schedule is shown in Figure 1.

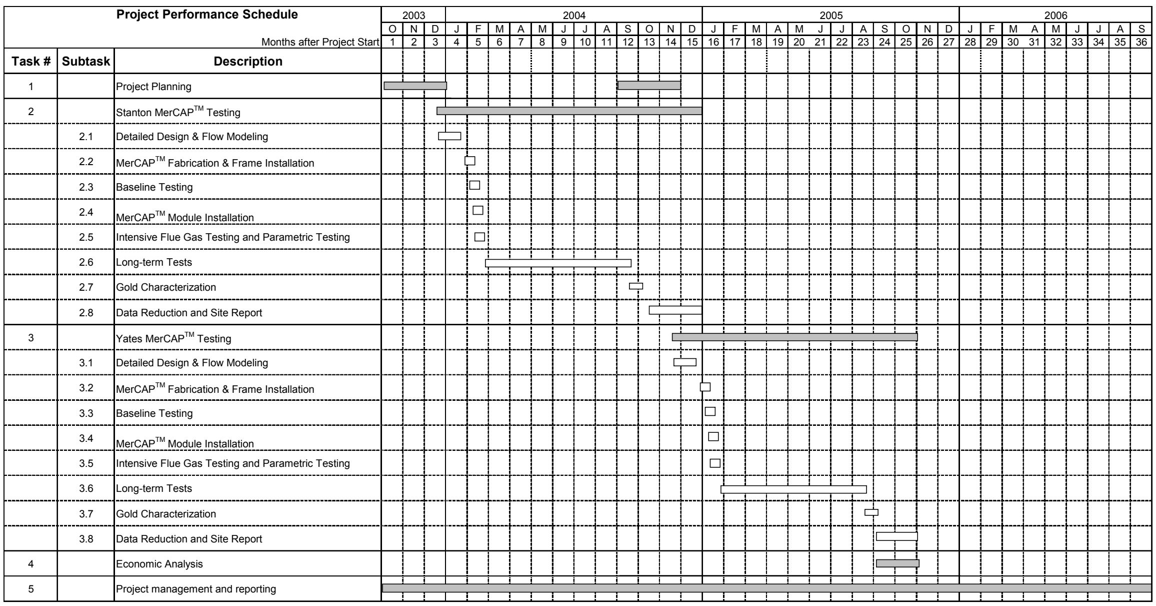

Figure 1 - Baseline project performance schedule

Each of the five major tasks is described in more detail below.

Task 1 - Project Planning

Following contract award, a detailed test plan will be developed by the project team outlining all planned activities for the project. The test plan will include host site background information, a detailed description of the test locations at both sites, planned test conditions, measurement devices and frequencies, samples to be collected, responsibilities of each subcontractor and cofunder, and the project schedule. Included with the test plan will be a stand-alone QA/QC plan describing all sampling and analytical methods and defining how data quality will be assured. Site-specific health & safety plans will also be prepared. The DOE Contracting Officer's Representative (COR) will be included in project team planning discussions to ensure that project objectives are clearly defined and that the proposed plan will enable project objectives to be met. A project kickoff meeting involving the entire team and the COR will be held at either NETL's Pittsburgh facility or at one of the host site locations. Site kick-off meetings will be held at each host site to discuss and coordinate arrangements for the installation and operation of test equipment for the test program.

Deliverables for this task will include the detailed test plan, QA/QC plan, and health and safety plan. Other plans and environmental documents required by the Reporting Checklist in the Cooperative Agreement issued by the Department of Energy will also be prepared under this task. The URS contracting department will set up all sub-contracts under this task.

Task 2 - Testing at Site 1 (Stanton Station)

Site 1 testing will be conducted at Great River Energy's lignite-fired Stanton Station in Stanton, North Dakota. Gold MerCAP^{TM} plates will be installed in one of the compartments in the Unit 10 baghouse, such that flue gas passes through the bags and then contacts the MerCAP^{TM} plates. The Stanton baghouse is comprised of ten individual compartments, each of which treat nominally 33,000 acfm of gas (6 Megawatt equivalent). Figure 2 shows the overall layout of the flue gas treatment system at Stanton Station.

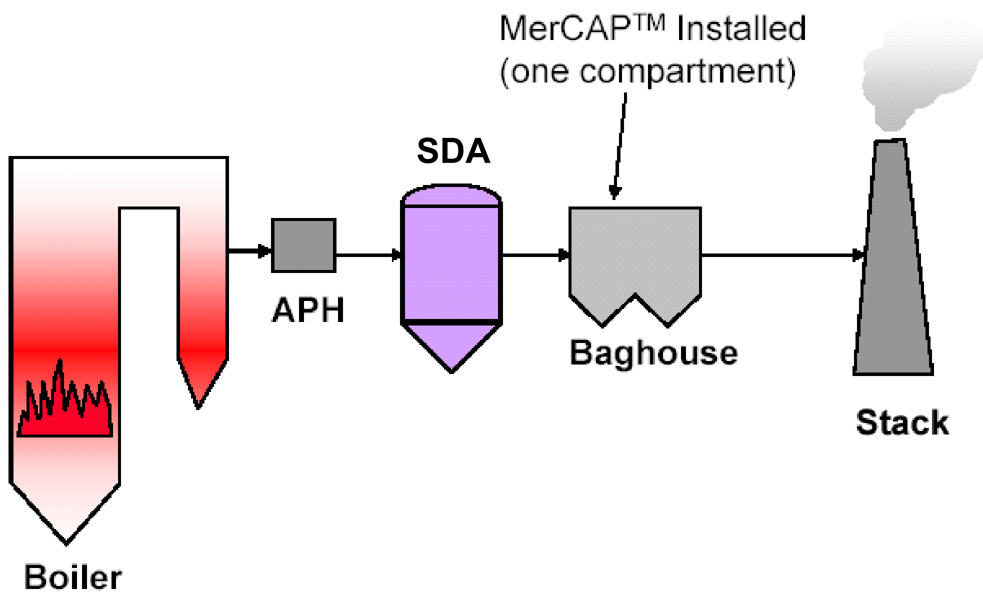

Figure 2 - Schematic of flue gas treatment system at Stanton Station

Task 2 includes activities required for the design, installation, operation, and testing of the MerCAP^{TM} array at Site 1. Details of each of these subtasks are given below:

Task 2.1 – Detailed Design & Flow Modeling

The MerCAP™ array will be installed in the clean side of a single compartment of the Unit 10 baghouse. A schematic drawing of the proposed configuration is shown in Figure 3.

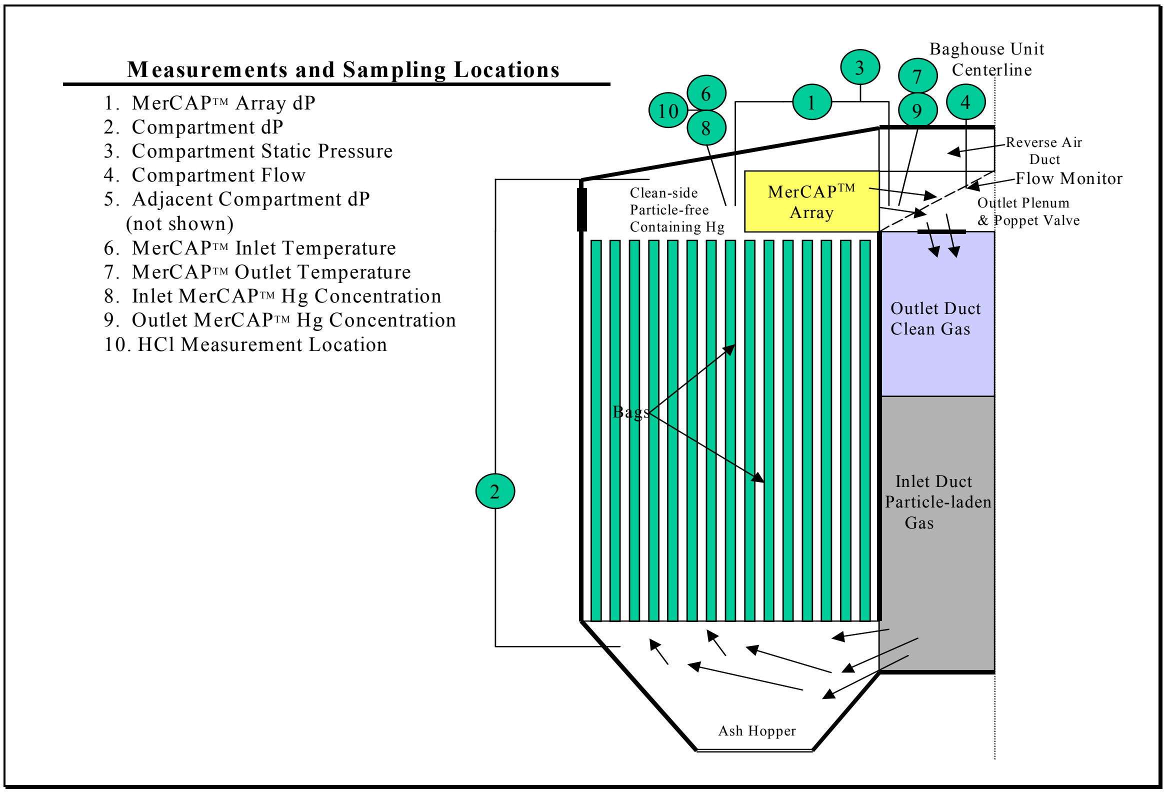

Figure 3 - Schematic of MerCAP™ installation in baghouse compartment, showing measurement and sampling locations

Utilizing the clean side of the baghouse compartment allows for access to the array for installation, maintenance, and periodic inspection since individual baghouse compartments can be easily isolated and ventilated for safe and simple personnel access without affecting the host combustor operation. This concept would additionally enable removal of the MerCAP™ elements for regeneration or replacement and provides for an economical retrofit technology at units utilizing baghouses. The support frame for the MerCAP™ arrays is currently sized and cost-based on an assembly of parallel plates projecting from the outlet poppet valve into the top of the baghouse. The current design is based on the 140-acfm pilot unit results and would use a minimum of 10 linear feet of plate length with a 1-inch plate separation. Modeling of the mercury capture and the gas flow affects of the MerCAP™ array will be conducted and used to refine the design. The final design will be determined from flow modeling studies based on the geometry, flue gas flow conditions, and mercury diffusivity. The plates will be sized and spaced to achieve at least 70% mercury removal. The flow-modeling portion of this effort will be used to confirm current measured and predicted values of pressure drop across the MerCAP™ array as well as assure that the final design provides a uniform and optimized flow field across the array to achieve maximum removal. This subtask will also include a plan for installing the MerCAP™ frames and plates, and for designing the sampling arrays. Inlet and outlet sampling arrays will be designed to allow continuous extraction of a gas sample from the inlet and outlet of the MerCAP™ array. These sampling arrays will utilize bulkhead feed-throughs on the outer wall of the baghouse compartment so that continuous samples of mercury concentrations (total and elemental gaseous) are available for analysis by semi-continuous analyzers or manual methods. These sampling arrays will be designed to provide short residence times, inertia particulate separation, and independent temperature control of the sample gas to minimize any bias of the mercury level in the sample gas.

Task 2.2 – MerCAP™ Fabrication & Frame Installation

The MerCAP™ array will be fabricated by electroplating gold onto a series of stainless steel plate substrates that are each 1-foot squares. The thickness of gold on the plates will be 13 microinches based on results from MerCAP™ probe tests. Four of the 1-foot square panels will be mounted in a light 2-foot square frame to facilitate handling and installation through the baghouse compartment access doors. The modules will slide into tracks mounted in the back section of the baghouse compartment. All components of the system will be fabricated off site in sections to allow access through the baghouse access doors. The host baghouse design and size allows for up to two full compartments to be off-line and isolated at any one time. Therefore, the MerCAP™ array can be installed without affecting host unit operation.

Task 2.3 – Baseline Testing

Following installation of the track and prior to installation of the MerCAP™ arrays, the flue gas will be characterized using both EPRI semi-continuous emission monitors (SCEMs) and Ontario Hydro (Ontario) measurement methods (ASTM D6784-02). SCEMs and Ontario mercury sampling methods will be conducted immediately upstream and downstream of the MerCAP™ Array location contained within the clean side of the baghouse compartment. Measurements and sampling locations are shown in Figure 3. Both measurement methods will utilize gas extracted from the inlet and outlet sampling arrays described in Task 2.1. The Ontario measurements will be a “modified” version that uses the existing sampling arrays and inertial filters in lieu of a quartz sampling probe. This is necessary as conventional sampling ports upstream and downstream of the MerCAP™ Array are not feasible or practical to install on the baghouse compartment. The “modified” Ontario measurements will not include particulate-bound mercury since any particulate matter will be separated in the sampling system. Since all sampling will be conducted on the clean side of the baghouse compartment, very low particulate emissions are expected and the fraction of mercury bound to this particulate would be very low if at all detectable. The objective of this program is to demonstrate the effectiveness of the MerCAP™ Technology to capture and remove gas-phase mercury, thus the measurement emphasis is the determination of vapor phase total and elemental mercury concentrations across the MerCAP ™ Array. Oxidized mercury is calculated as the difference in total and elemental vapor-phase concentrations. A dual-channel SCEM, switching between inlet to outlet sampling locations, provides the accurate differential measure necessary to determine mercury capture performance. The modified Ontario method will be used to verify the accuracy of the SCEM measurements.

Plant operational data will be collected to determine if variations in measured mercury can be attributed to changes in system operation. Plant data collected will include coal burn rate, boiler load, boiler oxygen concentration, duct temperature, plant SO_2 and NO_x concentrations, opacity, stack flow, and baghouse pressure drop and clean frequency. Lignite coal samples and baghouse solids will be collected daily while test crews are on-site for characterization. Lignite characterization will include ultimate and proximate analyses as well as mercury and chlorine content. Ash samples will be analyzed for mercury to enable material balance calculations to be made.

Hydrogen chloride (HCl) concentration measurements will also be collected using EPA Method 26A at the MerCAP™ inlet location utilizing the sample extraction system . The HCl measurements will be conducted during the three times while Ontario measurements are being made, once during baseline, once during intensive, and once at the end of the long-term test periods.

Flue gas flow through the test baghouse compartment will be continuously monitored using a differential pressure flow monitor array located at the outlet of the compartment (immediately downstream of the MerCAP™ Array). This flow measurement will be used to determine short and long-term changes to the compartment flow performance. The test compartment flow will be correlated to the stack flow measurement during all test periods. Pressure transducers will be installed to measure differential pressure drop across the MerCAP™ Array, compartment differential pressure drop, and the adjacent compartment differential pressure drop. A static pressure measurement at the outlet of the baghouse compartment, downstream of the MerCAP™ Array will measured. Temperatures on the inlet and outlet of the MerCAP™ Array will be recorded. These measurements will be read electronically on 1 second intervals, averaged and stored on a 5 minute basis by a dedicated data logging system for the duration of the field testing effort. A summary of data to be collected during baseline testing is included in Table 1.

Table 1 – Parameters and Sample Locations Measured in MerCAP^{TM} Test Program at Site 1

Parameter	Sample Type/Method	Sample Location(s)	Test Period (B=Baseline, I=Intensive, L=Long-term)
Gas Characterization			
Temperature	Thermocouple K-Type	MerCAP^{TM} inlet MerCAP^{TM} outlet	B, I, L, 5 min continuous to logger
Compartment gas flow	Pressure transducer, Pitot array	BH compartment outlet	B, I, L, 5 min continuous to logger
Mercury (vapor-phase total and elemental)	SCEM	MerCAP^{TM} inlet MerCAP^{TM} outlet	B, I, L
Mercury (vapor-phase total and elemental)	Ontario Hydro (modified)	MerCAP^{TM} inlet MerCAP^{TM} outlet	B, I, L
Differential pressure	Pressure transducer	MerCAP^{TM} inlet & outlet; BH compartment inlet & outlet; Adjacent BH compartment inlet & outlet	B, I, L, 5 min continuous to logger
Static pressure	Pressure transducer	BH compartment outlet	B, I, L, 5 min continuous to logger
NO_x, SO_2, O_2, opacity	Plant CEMs,	Plant stack	B, I, L, 5 min continuous
HCl	EPA Method 26A	MerCAP^{TM} inlet	B, L
Solids Characterization			
Lignite coal: ultimate, proximate , total Hg, Cl, heating value	Batch composite	Supply conveyor	B, I, L, daily
Fly ash: total Hg	Batch composite	BH compartment hopper below MerCAP^{TM}	B, I, L
Plant Process Parameters			
Coal burn rate	Plant DAS	TBD	B, I, L, 5 min continuous
Unit 10 Load	Plant DAS	TBD	B, I, L, 5 min continuous
BH cleaning frequency	Plant DAS	TBD	B, I, L, 5 min continuous
BH flange-to-flange pressure drop	Plant DAS	TBD	B, I, L, 5 min continuous

Task 2.4 - MerCAP™ Module Installation

Following initial baseline testing MerCAP™ modules will be mounted into the frames installed in Task 2.2. Installation will occur while the plant is operating since the baghouse compartment can be isolated from the system. The 2-ft by 2-ft modules will be carried into the isolated compartment and slid and secured into the track frame structure. Based on the preliminary design of the MerCAP™ modules, the installation time for one compartment should be completed by three personnel in approximately 8 hours.

Task 2.5 - Intensive Flue Gas Testing and Parametric Testing

Following installation of the gold plates at Site 1, a seven-day intensive test will be conducted to characterize the flue gas flowing across the MerCAP™ Array in the baghouse compartment. Total and elemental vapor-phase mercury measurements at the inlet and outlet of the MerCAP™ Array will be made around the clock to determine the extent of removal achieved. Ontario measurements will again be obtained to validate and confirm the SCEM measurements and the mercury removal performance. The plant will operate under constant load conditions during the intensive period, if possible. Plant and MerCAP™ operating data will be monitored for comparison to the SCEM and manual sampling results as defined in Table 1.

As part of this sub-task, a Mini-MerCAP™ probe will be used to evaluate the stability of the MerCAP™ plates following multiple regeneration cycles and to measure the effect of velocity on mercury removal. This probe is designed to operate extractively or in-situ. During parametric testing, the probe will be installed through the wall into the top of the baghouse compartment (clean side). A sketch of the probe is presented in Figure 4.

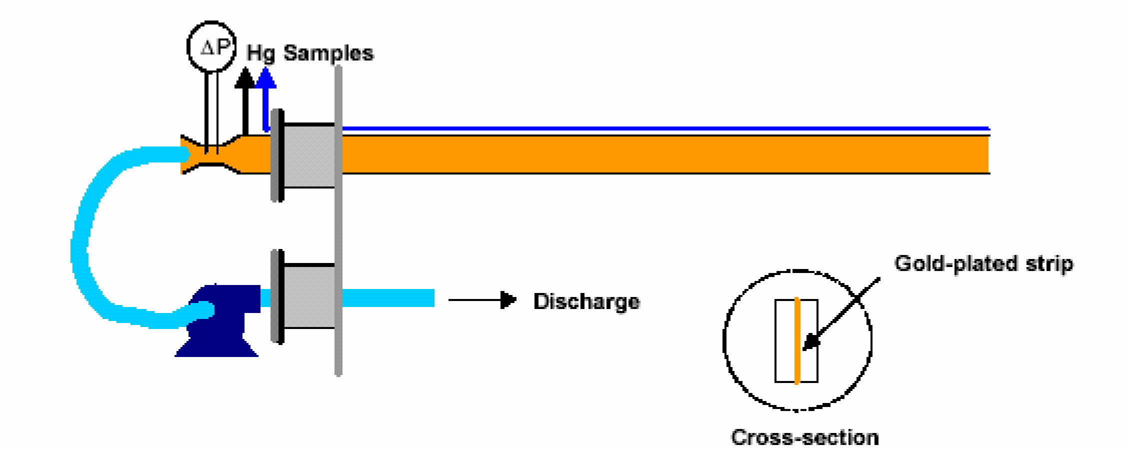

Figure 4 - Schematic of Mini-MerCAP™ apparatus

A 10-foot by 2-inch gold-coated plate is installed in the probe. During parametric testing, the flow rate of gas through the probe will be varied between 5 and 50 ft/sec. Tests will be conducted at compartment temperature. The resulting mercury removal across the probe will be measured.

The Mini-MerCAP™ probe will be used to demonstrate and confirm the durability of the gold plate material to withstand multiple thermal regeneration cycles. During the intensive test period a thermal regeneration cycle will be performed daily. Mercury capture across the probe (inlet to outlet) will be measured with the SCEM under normal operating conditions immediately prior to regeneration. Flow through the probe will be decreased and the gold will be heated to a temperature range of 450-850^{o}F for a minimum of 1 hour to desorb captured mercury. A total carbon trap will be used to capture the mercury sample desorbed during this process. After completion of the regeneration cycle the SCEM will again be connected to the probe at normal operating temperatures and flows and post regeneration performance will documented. Comparison of mercury removal before and after each regeneration cycle will be used to assess the effectiveness of the regeneration process. During long-term testing the Mini-MerCAP™ probe will be thermally cycled at least once per site-visit. The intent is to demonstrate a minimum of up to 12 regeneration cycles or determine if there is media degradation due to thermal cycling.

It is recognized that these tests do not establish a “capacity” of the gold media for mercury capture. The test is designed to establish if multiple thermal regenerations degrade mercury capture performance of the gold media. Analysis of the carbon traps used during thermal regeneration will establish a mass balance for the probe. Plant data, such as coal burn rate, boiler load, boiler oxygen, duct temperature, plant SO_2 and NO_x concentrations, and stack flow, will be monitored to identify conditions that may affect the performance of the MerCAP™ Array and Mini-MerCAP™ probe.

Task 2.6 – Long-term Tests

Following intensive testing, the baghouse MerCAP™ Array and the Mini- MerCAP™ unit will be operated continuously over a six-month period, during which intermittent checks on performance will be conducted. Mercury concentration and speciation measurements will be made every 700 to 1000 hours of service. Inlet and outlet mercury measurements across the MerCAP™ array will be conducted in order to determine if there is any decrease or change the mercury removal efficiency. During each site visit, regeneration tests will be conducted with the mini- MerCAP™ unit, as described in Task 2.5. During long-term testing, the flow rate and temperatures across the MerCAP™ unit will be monitored continuously and recorded to a data logger system. The Unit 10 boiler will operate under normal conditions (daily cycling) during the long-term test period. Plant operating data will be monitored throughout the test program for comparison of performance data. This will provide indication of mercury removal as a function of boiler load. At several times during the long-term test, samples of byproduct solids will be obtained from the Unit 10 BH compartment fitted with the MerCAP™ Array and sent to a DOE contractor for mercury stability testing.

Task 2.7 - Gold Characterization

At the conclusion of the long-term tests, the gold plates from the MerCAP™ Array will be removed and sections of the plates will be available for analysis in the laboratory. Small sections from the inlet, middle, and outlet will be thermally regenerated and the desorbed mercury measured. This data will be used to establish a mass balance for the MerCAP™ demonstration and confirm earlier regeneration/mass balance data from the Mini-MerCAP™ probe. These laboratory analyses may assist in establishing gold media capacity.

In the event of early degradation of mercury capture performance, sections of the array will be characterized with surface analytical methods, such as Auger spectroscopy or X-ray fluorescence spectroscopy (XRF), in order to determine the nature of any species bonded to the gold surface. These data will provide important information for estimating the gold-plate lifetime in flue gas. Coupons of the gold media from the same production batch as those used in both the Array and probe will be stored for potential comparison purposes.

Task 2.8 - Data Reduction and Site Report

Data gathered from the various gas characterization efforts made during each of the site visits will be analyzed immediately. These data will be correlated with plant and MerCAP™ operating data obtained from each respective test period. Mercury data collected from flue gas measurements will be compared to fuel and byproduct solid data to calculate mercury material balances across the Unit 10 flue gas path. While the baghouse MerCAP™ array and Mini-MerCAP™ probe are operating unattended, data will be downloaded from the respective data loggers by plant personnel and forwarded to project engineers for data analysis. A site report will be prepared documenting measurements, test procedures, analyses, and results obtained in Task 2.

Task 3 - Testing at Site 2 (Plant Yates)

Site 2 testing will be conducted at Southern Company Services' low-sulfur bituminous-fired Plant Yates in Newnan, Georgia. Gold-plated structures will be configured as a mist eliminator in an existing pilot-scale absorber unit that receives flue gas downstream of the Unit 1 FGD absorber (Figure 5).

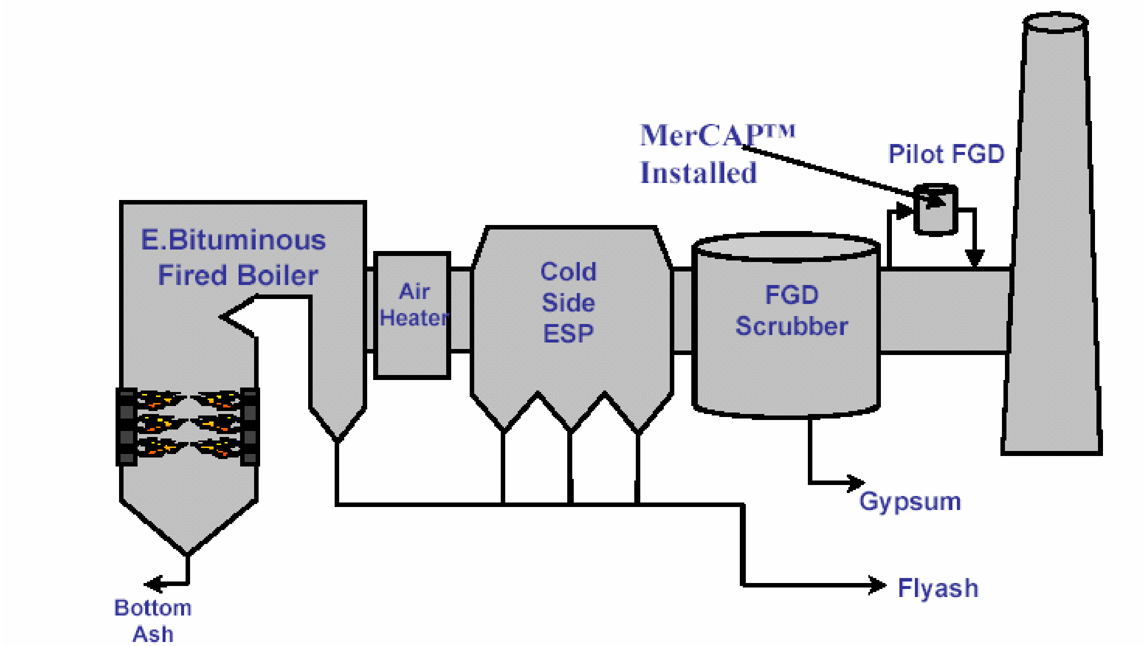

Figure 5 - Schematic of MerCAP™ installation at Plant Yates

The Site 2 test program will be structured in a similar manner as the Site 1 program described in Task 2. Thus, many of the Task 3 subtasks will be identical to those in Task 2. Differences between the two sites are summarized below.

Task 3.1 - Detailed Design & Flow Modeling

A pilot MerCAP™ array will be installed as a mist eliminator module configured in an existing pilot unit. The test module will be designed within a 24-in (ID) pipe section that will be inserted to replace an existing section of ductwork on the existing pilot unit. A schematic drawing of the proposed test module is shown in Figure 6. A detailed design for the pilot mist eliminator gold plate structure will be made based on the operating parameters of the full-scale mist eliminator. This will include plate length and spacing to achieve 80% mercury removal at a linear gas velocity of 20 ft/sec. In addition, a plate washing configuration will be designed to provide a similar liquid-to-plate wash ratio as used in the full-scale unit.

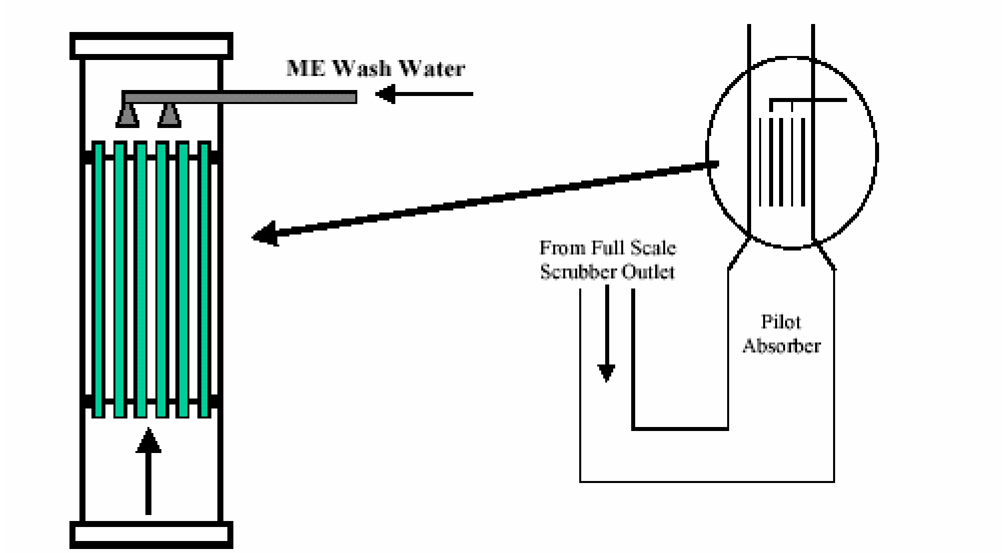

Figure 6 - Schematic of MerCAP™ configured as a mist eliminator (ME)

Task 3.2 - MerCAP™ Fabrication & Frame Installation

The MerCAP™ mist eliminator module will be constructed by a sub-contracted fabricator based upon the final design. Gold-coated structures will be prepared using the same process as for Site 1 and inserted into the test module by the fabricator. The completed test module will be shipped to Plant Yates for installation.

Task 3.3 - Baseline Monitoring

Baseline measurements will be made, as described in Task 2.3, across the pilot absorber unit prior to installation of the test module. Mercury measurements will be made at both the inlet and outlet to the pilot unit. Plant data and samples will be obtained as described below in Table 2; plant process data will include points downstream of the FGD system.

Task 3.4 - MerCAP™ Module Installations

The completed test module will be inserted into the gas path of the pilot absorber unit (Figure 6). It is anticipated that installation will not impact the operation of the full-scale unit as pilot unit tie-ins are already in place.

Table 2 – Parameters and Sample Locations Measured in MerCAP^{TM} Test Program at Site 2.

Parameter	Sample Type/Method	Sample Location(s)	Test Period (B=Baseline, I=Intensive, L=Long-term)
Gas Characterization			
Temperature	Thermocouple	Pilot absorber outlet (MerCAP^{TM} ME inlet)	B, I, L
Duct Gas Velocity	EPA Method 1	Pilot absorber outlet (MerCAP^{TM} ME inlet)	B, I, L
Mercury (total and elemental)	SCEM	Pilot absorber outlet (MerCAP^{TM} ME inlet)	B, I, L
		MerCAP^{TM} ME outlet	B, I, L
Mercury (total and elemental)	Ontario Hydro	Pilot absorber outlet (MerCAP^{TM} ME inlet)	B, I, L
		MerCAP^{TM} ME outlet	B, I, L
NO_x, SO_2, O_2	Plant CEMs	Pilot absorber inlet and MerCAP^{TM} ME outlet	B, I, L
HCl	EPA Method 26A	Pilot absorber inlet and MerCAP^{TM} ME inlet	B, L
Solids Characterization			
Coal: ultimate, proximate, Hg, Cl, heating value	Batch composite	Boiler feed	B, I, L
Fly ash and FGD solids: total Hg	Batch composite	ESP hoppers or silo, absorber slurry blowdown	B, I, L
Plant Process Parameters			
Coal burn rate	Plant DAS	TBD	B, I, L
ME wash frequency and wash rate	Plant DAS	TBD	B, I, L
ME pressure drop	Plant DAS	TBD	B, I, L
Unit 1 load	Plant DAS	TBD	B, I, L
Absorber Parameters: gas rate, L/G, pressure drop, pH, level, % oxidation, slurry feed rate	Plant DAS	TBD	B, I, L

Task 3.5 - Intensive Flue Gas Testing

Following installation and startup of flue gas through the MerCAP^{TM} test module, a 1-week intensive flue gas characterization test will be performed, as described in Task 2.5. As at Site 1, a Mini- MerCAP^{TM} probe will be configured downstream of the full-scale scrubber to evaluate regeneration of the gold structures.

Task 3.6 – Long-term Testing

Following intensive testing, the mist eliminator MerCAP^{TM} Array the mini-MerCAP^{TM} unit will be operated continuously over a six-month period, during which intermittent checks on performance will be conducted as described previously in Task 2.6. The Plant Yates Unit 1 boiler and FGD system will operate under normal conditions during the long-term test period. At several times during the long-term test, samples of the fly ash and byproduct solids from the Unit 1 ESP and the Unit 1 FGD absorber will be collected and sent to a DOE contractor for Hg stability testing.

Task 3.7 - Gold Characterization

Gold characterization will be carried out similarly as described in Task 2.7.

Task 3.8 - Data Reduction and Site Report

Data reduction will be carried out similarly as described in Task 2.8 for Site 1. At several times during the long-term test, samples of byproduct solids will be obtained from the Unit 1 ESP and wet absorber and sent to a DOE contractor for Hg stability testing. A site report will be prepared documenting measurements, test procedures, analyses, and results obtained in Task 3.

<u>Task 4 - Economic Analysis</u>

The data gathered from the test programs at Sites 1 and 2 will provide information needed to refine cost estimates for using MerCAP^{TM} technology for controlling mercury in flue gas. EPRI models based upon current pilot-scale data will be refined by incorporating data from the full-scale baghouse compartment and pilot mist eliminator demonstrations. Data pertaining to attainable mercury removal efficiencies will be correlated to other performance aspects, such as pressure drop, estimated sorbent lifetimes, and installation costs. The results obtained during the long-term performance tests, Mini-MerCAP^{TM} regeneration tests, and post-test gold surface analyses should provide data necessary for better predicting MerCAP^{TM} sorbent lifetime. All of the test program data will be compiled to provide an analysis of the economic merits of MerCAP^{TM} technology for use downstream of baghouses and wet scrubbers.

Task 5 - Project Management and Reporting

Task 5 covers all planning, management, and coordination activities associated with the project. URS Group will assume overall project management responsibilities for the proposed test program including coordination of all primary program tasks. A program management team, consisting of team members from each participating organization and NETL, will be formed to provide technical guidance for the overall program. At the onset of the program, the management activities will be primarily planning activities. Throughout the program activities to disseminate the progress and results of the project, reporting and technology transfer activities will be conducted, including preparing information for COR briefings, DOE contractor review meetings, and other technical meetings.

D. DELIVERABLES

The initial project test plan, QA/QC plan, and health & safety plan will be finalized by the project team and submitted to the NETL COR for review and acceptance.

A project kickoff meeting will be held within 60 days after project award. It is anticipated that the project kickoff meeting will be held via teleconference, and by videoconference if possible, to minimize travel costs and to maximize participation by all project team members. URS will prepare a presentation summarizing the objectives and work to be performed during the project, and distribute this presentation to all project participants to facilitate discussion during the kickoff meeting.

On a quarterly basis, Federal Assistance Program/Project Status Reports and Financial Status Reports will be prepared and submitted to DOE/NETL.

On a quarterly basis, Technical Progress Reports will be generated to summarize the results of the MerCAP^{TM} test program. Each Technical Progress Report will include a summary of all data obtained, problems encountered, and plans for the immediate future.

On a quarterly basis, in conjunction with the Technical Progress Reports, an electronic (Power Point) presentation will be generated and delivered to the NETL COR. The NETL COR will provide URS with a presentation template for this purpose.

Topical reports will be prepared to describe the testing conducted at each field test site. Each Topical Report will include detailed descriptions of the experimental methods used, data and other results obtained, and problems encountered at the field test site. It is anticipated that two Topical Reports will contain more complete and detailed discussions of the results and their implications than the quarterly Technical Progress Reports.

A final report will be issued at the end of the program summarizing the results of testing at Sites 1 and 2 and the final economic analysis. Environmental reports will be prepared, including a Hazardous Substance Plan once the award is made and a Hazardous Waste

Report at the end of the program. A property report, consisting of a Report of Termination or Completion Inventory, will also be submitted at the end of the program.

Table 3 is a schedule of key deliverables/milestones associated with the project, based on a nominal start date of November 1, 2003.

Table 3 – Milestones and Deliverables, DOE-URS Cooperative Agreement

Milestone/Deliverable	Date
Submit Hazardous Substance Plan & Environmental Questionnaire - Site 1	11/17/03
Project Kickoff Meeting	11/30/03
Submit Test Plan, Site 1	12/08/03
Complete Frame Installation/Baseline Monitoring, Site 1	01/26/04
Complete MerCAP^{TM} Module Installation/Intensive Testing, Site 1	02/09/04
Complete Long-term Testing, Site 1	09/10/04
Site 1 Review/Site 2 Planning Meeting	09/06/04
Submit Hazardous Substance Plan & Environmental Questionnaire - Site 2	09/13/04
Submit Test Plan, Site 2	10/11/04
Complete Frame Installation/Baseline Monitoring, Site 2	11/29/04
Complete MerCAP^{TM} Module Installation/Intensive Testing, Site 2	01/03/05
Complete Long-term Testing, Site 2	08/02/05
Submit Quarterly Technical Progress Reports and Presentations	1/28/04; 4/31/04; 7/31/04; 10/31/04; 1/28/05; 4/31/05; 7/31/05; 10/31/05; 1/28/06; 4/31/06; 7/31/06
Submit Topical Report, Site 1 Results	12/31/04
Submit Topical Report, Site 2 Results	10/31/05
Submit Draft Final Report	03/31/06
Submit Final Report	09/30/06

E. BRIEFINGS/TECHNICAL PRESENTATIONS

A project kickoff meeting will be held within 60 days after project award. It is anticipated that the project kickoff meeting will be held via teleconference, and by videoconference if possible, to minimize travel costs and to maximize participation by all project team members. URS will prepare a presentation summarizing the objectives and work to be performed during the project, and distribute this presentation to all project participants to facilitate discussion during the kickoff meeting.

Before experiments begin at each field site, it is expected that meetings/briefings will be held at each host plant. The purpose of these meetings will be to finalize experimental protocols, clear up any remaining issues regarding plant site support, and answer any questions of the project technical advisory committee. These pre-experiment meetings will be held via teleconference to allow participation by all project technical advisory committee members.

It is anticipated that the preliminary results of the project will be presented at conferences or workshops sponsored by DOE, EPRI, EPA, or other organizations. If participation in such conferences/workshops will be supported by the DOE-URS Cooperative Agreement, URS will provide information (dates, location, etc.) to the DOE COR prior to the event.

At the request of the DOE COR, detailed briefings shall be presented to explain the plans, progress, and results of the project.